US Army Corps of Engineers®
Engineer Research and Development Center

Snow Hydrology

Problem

Snow covers much of the earth permanently or seasonally. The physical aspects of a snow cover, from grain-scale relationships to areal extent of coverage, ultimately control many of the chemical and biological processes that occur above, within, or beneath the snow cover. An understanding of these processes and their interaction is essential to predict their respective influence and the potential future changes in their environments.

Prediction of snow property distributions and melt in remote areas is possible through a combination of advanced remote sensing approaches and snow process models

Description

Researchers at the Engineer Research and Development Center's Cold Regions Research and Engineering Laboratory (ERDC-CRREL) are conducting ongoing research in snow hydrology ranging from the ice caps of Greenland and Antarctica to the ephemeral snow covers of the Alaskan Arctic and continental United States. This work meshes with studies on military training ranges, soil biogeochemistry, ice sheets and sea ice, atmospheric chemistry, and remote sensing of snow-covered terrain.

Snow hydrology research at ERDC-CRREL is being conducted in the following areas:

- Melt pathways in snow;
- Roughness lengths over snow;
- Snow-covered area mapping;
- Snowmelt and frozen soil models;
- Snowpack property and isotopic evolution during snowmelt;
- Spatially distributed snow models;
- Watershed and water supply management;
- Wind redistibution of snow.

Expected Products

The primary mission of this research is to advance the fundamental understanding of snow, ice, and frozen ground properties and processes.

Potential Users

The snow and ice research community worldwide will benefit from this research.

Projected Benefits

Current research defining the fundamental shapes of snow property solution domains addresses a broad and longstanding problem of how to continuously map snow properties with quasi-distributed energy balance models, the efficient attribution of snow properties in virtual environments, and initial conditions for climate models. Improved understanding of snow processes and snow-cover mapping leads to improved awareness of the snowpack state, its interaction with the biosphere and atmosphere, and improved snowmelt runoff and water supply forecasts.

Program Manager

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